Editorial

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A New Decade of Research on the Economics of Climate Change

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Addressing the climate crisis is one of the central sustainability challenges for our global societies. Economists have been thinking about the problem of environmental degradation at least since the 1960s (Boulding 1965, 1966). From the 1970s onwards, concerns about the effect of greenhouse gases on the global climate have gained ever more prominence in the debate, and economic analyses of the climate problem have mounted (Nordhaus 1975, 1977).[1] The publication of the Stern Review in 2006 designated the climate crisis as the *"greatest market failure the world has ever seen"* (Stern 2007) and thereby critically shaped the perceived relevance of research on the economic characteristics of the climate problem. Seventeen years later, the number of publications in the field has increased tremendously, but still many important research questions remain open. One major research challenge is to embed the economics of climate change in a broader research agenda on a sustainable economic management of the interconnected dynamics of the atmosphere and the biosphere (Dasgupta 2021). Future research on the economics of climate change should address the interplay between economic efficiency and the distribution of well-being between and within generations by taking into account (i) how climate mitigation and adaption can contribute to protecting a healthy biosphere and (ii) how a healthy biosphere benefits the climate. This editorial briefly introduces a selection of six key areas for a new decade of research on the economics of climate change and subsequently, briefly relates the articles of this Special Issue to these topics.

1 These early working papers of Nordhaus are described by Jaeger and Jaeger (2011) as probably the first suggestion of an economist to use 2 °C as a critical limit for climate policy. The authors provide an interesting interpretation of the history of temperature targets in climate policy.

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1 Social Discounting, Mitigation and Planetary Boundaries

The climate crisis is an intergenerational crisis: since CO_2 is a long-lived atmospheric pollutant, the costs of mitigating a ton of CO_2 today have to be evaluated against the cumulative damages that ton will impose on both today's as well as on all succeeding future generations. As a consequence, economically optimal climate policy is very sensitive to the choice of the social discount rate used to value the intergenerational costs and benefits of climate change mitigation (Hänsel et al. 2020). Seventeen years ago, the Stern review (Stern 2007) initiated a debate on whether the determinants of the social discount rate should be chosen on ethical grounds as opposed to calibrating it based on historical returns observed on capital markets (Nordhaus 2018). That discussion quickly also led to extensions of the standard discounting and welfare framework considering amongst others uncertainty (Gollier 2010, 2019) and environmental and non-market goods scarcity (Drupp and Hänsel 2021; Hoel and Sterner 2007). One key question is how the welfare economics of climate change can be transformed into a welfare economics of planetary boundaries by considering the interrelations between the increasing scarcity of natural goods and services and climate change in the presence of risk and uncertainty?

2 Climate Impacts, Damages and Adaptation

While adaptation has the potential to reduce many of the adverse impacts of climate change, adaptive capacity varies widely across regions and affected systems (Massetti and Mendelsohn 2018). Moreover, climate change and biosphere degradation affect many goods and services without real market prices, such as the recreational, cultural or spiritual values of natural areas or the existence value of particular species (Dasgupta 2021). Thus, the benefits of adaptation policies are often difficult to quantify for these cases. Key questions that future climate economic research should address in that area include: What are efficient adaptation policies that consider heterogeneous climate damages, the role of non-market goods and services as well as equity impacts of alternative actions? What are the limits to adaptation and what are the trade-offs between investing public funds in adaptation versus mitigation?

3 Carbon Dioxide Removal Technologies, Economic Optimality and Social Acceptance

As climate action has been delayed since the publication of the Stern review, meeting the targets of the Paris agreement increasingly requires larger scale carbon dioxide removal (CDR) at least by around mid-century (IPCC 2022). Key questions for climate economists in that area are: How to best incentivize an efficient development and deployment of different CDR technologies at the required scale (Edenhofer et al. 2023)? How to take into account the inter- and intra-generational distributional consequences of different policies and how to increase the required social acceptance?

4 Governance of the Commons, Climate Policies and Political Feasibility

Good governance of the global commons and distributional consequences for the current generations are increasingly perceived as key obstacles to the implementation of effective policy instruments that ensure a sustainable use of both the biosphere and atmosphere. For example, the fear of regressive distributional effects of carbon pricing on low-income households is considered as one of the main reasons for the failure to implement effective climate policies (Edenhofer et al. 2021). Key question that future research should address are: How can national and international climate policies account for the trade-offs between equity and efficiency (Hänsel et al. 2022), and increase trust in regulatory decisions? What are the distributional consequences of different policy instruments regimes, such as taxes, permits, standards or bans?

5 International Cooperation, Climate Treaties and Finance

Effective climate stabilization can only be achieved through international cooperation and climate treaties, which incentivize public and private investments to finance the transformation towards a carbon-neutral economy. That is because increasing levels of combined climate efforts actually raise the incentives for single states to reduce their contributions and to free-ride on the emissions reductions of other states. In game theory, this phenomenon is known as social dilemma: as the

overall benefits from cooperating increase, individual countries are increasingly tempted to benefit from the collective action while avoiding costs themselves (Edenhofer and Jakob 2019; Hirshleifer 1983). To enhance cooperation and discipline free-riders, reciprocal commitments and mutual trust are needed. This points to questions on how to implement self-enforcing international agreements: climate clubs, funds that provide conditional transfers, sectoral treaties or emerging social norms are promising candidates that may allow to overcome the cooperation problem between nation states.

6 Biodiversity Loss, Ecosystem-Services and Climate Change

Climate change and biodiversity loss are deeply interrelated (IPBES 2019; Richardson et al. 2023). Biodiversity affects ecosystem productivity and thus the services that nature provides for human well-being (Dasgupta 2021). For example the Amazon stores an amount of carbon equivalent to a decade of global human emissions. Understanding the synergies and trade-offs between climate and biosphere protection as well as repercussions with economic dynamics is thus key for sustainable development. What are the benefits for biodiversity of mitigating against dangerous climate change? What are the benefits of avoiding biodiversity loss on climate damages? How can people adapt to climate change and biodiversity loss?

7 Contributions in the Special Issue

Sureth et al. (2023) provide an article that can itself be understood as a research agenda on an economic perspective of the interconnected climate and biosphere crises and thus, contribute to the research areas 1 and 6. Specifically, they use a theoretical modelling framework to discuss how to integrate planetary boundaries, such as related to the climate or to biosphere integrity, into public economic cost-benefit and cost-effectiveness analyses. The article provides guidance on how to overcome shortcomings of current policy practice and discusses important directions for future research on planetary boundaries as global public goods.

Hofmann et al. (2022) contribute to the research area 5 by analyzing the role of commitment devices for the effectiveness of international cooperation. Specifically, they put forward a novel experimental format based on simulating international climate negotiations with “Model United Nations” associations in Germany and Switzerland. They test if international climate negotiations about a uniform common

commitment, such as uniform carbon pricing, are more effective as compared to individual commitments as currently formalized by the Nationally Determined Contributions to reach the Paris Agreement. The article finds that negotiating a common commitment on uniform carbon pricing results in higher emission reductions as compared to individual commitments. This results is then discussed in the light of the current literature on climate negotiations, experiments on public good provision, political science and education with simulation games.

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